RESEARCH REPORTS

FACTORS ASSOCIATED WITH INCREASED USE OF COGNITIVE AIDS

Bryan Harmer, PhD, CCP, IC*[1]; Melissa Ivey, MPH[2]; John D. Hoyle, Jr., MD[3]; Kieran Fogarty, PhD[4]

Author Affiliations: 1. Western Michigan University School of Medicine, Department of Emergency Medicine, Kalamazoo, Michigan, USA; 2. No Affiliation; 3. Western Michigan University School of Medicine, Departments of Emergency Medicine & Pediatrics, Kalamazoo, Michigan, USA; 4. Western Michigan University, Interdisciplinary Health Sciences, Kalamazoo, Michigan, USA.

Corresponding Author: bhk9573@wmich.edu

ABSTRACT

Background: Cognitive aids are an essential aspect of patient care within emergency medical services (EMS). Despite their availability in EMS, these aids are underutilized. Understanding factors associated with increased use of cognitive aids can help guide the development of effective implementation strategies. This study examines the association between the frequency of cognitive aid use in EMS and three factors: the use of these aids in initial education programs, policies mandating their use, and clinicians' perceptions of cognitive aid usefulness.

Methods: This study used a cross-sectional survey examining the use, previous training, policy, and perceived usefulness of 15 selected cognitive aids. The survey was emailed to 136,093 EMS clinicians in six participating states (TX, ME, MI, LA, SC, and AR). Descriptive statistics were used to describe the examined factors. Bivariate analysis was used to examine the relationship between the use of each cognitive aid and previous training with the aid, requirements for use, and perceived usefulness.

Results: A total of 2,251 respondents met inclusion criteria and were included in the study. The length-based tape was the most common aid used during initial education programs (n=1724, 77.0%) and to have policy requiring its use during patient care (n=1194, 53.0%). Aids associated with pediatric medication administration were perceived as most useful. Clinicians were more likely to use a specific aid if there was policy requiring its use, if they used the aid during their initial education programs, or if they perceived it to be useful.

Conclusions: The results of this study suggest that integrating a cognitive aid into EMS initial education programs, having policy requiring its use, and the aid being perceived as useful are all associated with increased use the aid during patient care. These results may provide valuable insights for devising more effective implementation strategies for cognitive aids.

INTRODUCTION

Cognitive aids are tools commonly used during patient care in emergency medicine. These include checklists, references, and aids used to limit the need for calculations during patient care (Keebler, 2017). Aids are typically designed to reduce cognitive load when performing a task, ultimately increasing the efficiency of the clinician (Corazza et al., 2020; Hall et al., 2020). Several cognitive aids have been found to reduce the incidence of error

associated with some medical procedures in EMS (Hall et al., 2020; Haynes et al., 2009; Hoyle et al., 2020), and are recommended by national EMS organizations (Counts et al., 2022; National Association of State EMS Officials, 2022).

Although many cognitive aids are available in EMS, their use appears limited. In our previous study, we used a cross-sectional survey to examine the frequency that 15 cognitive aids were used in EMS during their related procedures or patient encounters. The survey found that only one of the listed cognitive aids, the length-based tape (LBT), was used "often" when its use was indicated. Almost half of the aids were reported as being used "rarely" (Harmer et al., 2024), which included aids that are recommended by national organizations (Counts et al., 2022).

Increasing the use of cognitive aids by clinicians during certain procedures or patient encounters can be difficult, and challenges have been reported in other areas of healthcare (Levy et al., 2012; Paugam-Burtz & Guerrero, 2011). The World Health Organization (WHO) developed the WHO Surgical Safety Checklist in 2008 to combat safety issues during surgery. However, the WHO faced serious resistance during early phases of implementation, with many surgeons refusing to use the aid. Much of this was due to unfounded concerns among clinicians such as significant delays in care, increased anxiety in the patient, and that the checklist was not valuable (Jain et al., 2018). These issues led to the WHO establishing the WHO Patient Safety Checklist Implementation Manual (World Health Organization, n.d.) to increase the frequency and appropriateness of its use.

Appropriate implementation strategies for cognitive aids in EMS may result in more effective adoption and increased use during patient care. Common strategies used when implementing a change in practice (such as introducing a new aid) include training and policy development, among others (Klaic et al., 2022). Some models highlight the value of perceived usefulness of technology and tools. The Technology Adoption Model posits that there are several factors that influence a person's decision about how and when they use technology (Bagozzi et al., 1992). Among these include perceived usefulness of the technology, which refers to the person's belief that it will enhance their job performance (Davis, 1989).

Strategies to increase cognitive aid use in EMS have not been identified, as the factors associated with the increase use of these aids are not well known. This study examined the relationship between cognitive aid use in EMS and three factors: training with cognitive aids during initial education programs, policy requiring the use of cognitive aids, and clinicians' perceived usefulness of cognitive aids.

METHODS

STUDY POPULATION AND INSTRUMENTATION

This was a planned subsequent analysis from the survey described in (Harmer et al., 2024). This was an online cross-sectional survey with six participating state EMS departments (TX, MI, AR, SC, ME, and LA). All licensed or certified EMS clinicians in these states were sent an email link to the survey, totaling 136,093 clinicians. Clinicians who were less than 18 years of age or do not work as an EMS clinician in an emergency response setting in the United States were excluded from the study.

This survey was developed using a modified Delphi method with 6 subject matter experts. An initial draft of the survey was pilot tested with subsequent cognitive debriefing. The survey was refined and a final draft of the survey was developed consisting of 80 items that focused on the use of 15 cognitive aids (Table 1). Participants were asked to rate how often they use each aid during its associated procedure or patient encounter, if they trained with the aid during their initial education program, if there was policy requiring them to use the aid, and their perceived usefulness of each aid. The survey was open from January 3, 2022 to January 16, 2022.

PROTECTION OF HUMAN SUBJECTS

Approval for this study was obtained through the Western Michigan University Institutional Review Board (reference number: 21-08-05). Prior to starting the survey, participants received information about the study's objectives and were informed of their freedom to exit the research whenever they chose. Informed consent was obtained at the beginning of the survey. The study did not gather any data that could personally identify participants, and their answers were directly uploaded to the SurveyMonkey (SurveyMonkey Inc., Menlo Park, CA) database. Upon completion of the response collection, the data was transferred to a distinct server safeguarded by a password. All ethical and regulatory protocols were strictly followed.

MEASURES

INITIAL EDUCATION AND POLICY

For each cognitive aid, participants were asked if they used them during their initial education program (e.g., paramedic program). Additionally, they were asked if there was a policy requiring them to use the aid during the associated procedure or patient encounter. Participants had the option to either select yes or no for each aid.

Perceived usefulness - Participants were asked to rate their perceived usefulness of the 15 cognitive aids, using a five-point Likert scale, during each aid's associated procedure or patient encounter. Participants could select "not applicable" if they were not familiar with the aid.

Frequency of cognitive aid use - Participants rated the frequency they use each cognitive aid using a five-point Likert scale. The frequency of cognitive aid use was compared to reported use of that aid during initial education, policy requiring its use, and the participants' perceived usefulness of the aid.

ANALYSIS

Data was exported to Stata IC 15.1 (StataCorp LP, College Station, TX) and descriptive statistics were used to examine demographic, employment data, and the frequency of cognitive aid use. Use of cognitive aids during participants' initial education program, requirements for use of cognitive aids, frequency of use during associated procedure or skills, and perceived usefulness of each cognitive aid were described using frequency and proportions or medians and interquartile ranges. Bivariate analyses exploring the relationship between frequency of use of each of the 15 cognitive aids and reported use during participants' educational programs, requirements for use, and perceived usefulness were also conducted using Mann-Whitney U tests and Spearman correlation

coefficients. Multivariate analysis was then performed using ordered probit regression to determine which of the significant variables in bivariate analyses retained their significance when considering all other factors.

RESULTS

Of the 136,415 EMS clinicians who received the survey, a total of 3,929 responses were collected, resulting in a response rate of 2.88%. A total of 1678 (42.7%) responses were excluded from the survey, resulting in a final sample size of 2,251. Responses were excluded due to the survey being incomplete (751, 19.1%), participant was not actively working as an EMS clinician in the U.S., participant was less than 18 years of age (614, 15.6%), participant did not provide consent (306, 7.8%), and concerns over validity of the data (7, 0.2%). Demographic and employment characteristics were significantly different between the included and excluded responses. Further details of these demographic differences can be found in Harmer et al., 2024.

Use of Cognitive Aids During Initial Education Program

Table 1 shows the cognitive aid use during initial education, requirements for cognitive aid use and perceived usefulness of cognitive aids. The most frequently used cognitive aids during initial education programs (i.e., EMR, EMT, AEMT, or paramedic programs) were the LBT, protocol referencing, the Glascow Coma Score (GCS) scoring template, pocket guides for cardiac arrest algorithms, pediatric color-based medication reference cards, the trauma score template, and paper templates for note taking during treatment. The least frequently used cognitive aids during educational programs were phone or tablet applications designed to calculate medications for adults and pediatrics.

Requirements to Use Cognitive Aids

Only one aid was reported as required by more than half of participants, the LBT. The GCS scoring template (46.5%), protocol referencing (42.2%), color-based medication reference cards (39.6%), and trauma score template (36.6%) were the next most required aids as reported by participants. The least frequently required cognitive aids were phone or tablet applications for calculating medications for adults (13.3%) and pediatrics (18.3%), and calculators for medication administration for adults (14.2%) and pediatrics (16.6%).

Perceived Usefulness of Cognitive Aids for Associated Skills

LBT, phone or tablet applications for pediatric medications calculations, and color-based medication reference cards were reported, to be "very useful" during associated skills for patient care (Med = 4.0, IQR: 2.0 – 4.0). Most other cognitive aids were rated as "mostly" useful, although checklists and mnemonics were rated as only "somewhat" useful (Table 1).

Relationships Between Frequency of Use, Training and Policy

All cognitive aids demonstrated a significantly greater frequency of use during patient care if participants used them during their initial education program and if an organizational or medical control policy or protocol required its use (p=<.001). Table 2 describes the median frequency of use with the interquartile range. These values are compared

Cognitive Aid	Use of Cognitive Aids During Initial Education Programs		Requirements to Use Cognitive Aids		Perceived Usefulness of Cognitive Aids During Associated Procedures/Encounters		
	N	%	N	%	Median	IQR	Correlating Usefulness
Phone or tablet application, specifically designed to calculate medications, for adult medication calculation	593	26.5	299	13.3	3.0	2.0 – 4.0	Mostly
Phone or tablet application, specifically designed to calculate medications, for pediatric medication calculation	652	29.1	413	18.3	4.0	3.0 – 4.0	Very
Calculator (handheld calculator device or a calculator on a phone or tablet) for adult medication administration	999	44.7	319	14.2	3.0	2.0 – 4.0	Mostly
Calculator (handheld calculator device or a calculator on a phone or tablet) for pediatric medication administration	1,032	46.1	374	16.6	3.0	2.0 – 4.0	Mostly
Pocket guides to reference treatment algorithms when managing patients in cardiac arrest.	1,245	55.6	504	22.4	3.0	2.0 – 4.0	Mostly
Length-based tape (e.g., Broselow tape) when treating pediatric emergencies	1,724	77.0	1,194	53.0	4.0	3.0 – 4.0	Very
Color-based medication reference cards when treating pediatric emergencies	1,233	55.1	891	39.6	4.0	3.0 – 4.0	Very
Checklist (paper or digital) when performing procedures (e.g., endotracheal intubation, supraglottic airway placement, medication administration)	1,010	45.2	617	27.4	2.0	1.0 – 4.0	Somewhat
Checklist (paper or digital) for managing patients in cardiac arrest (e.g., CPR checklists, defibrillation checklists)	1,019	45.5	556	24.7	2.0	1.0 – 4.0	Somewhat
Protocol referencing (paper or digital) when treating patients (any condition or age)	1,564	70.0	950	42.2	3.0	2.0 – 4.0	Mostly
Paper templates for note taking when treating patients (any condition or age)	1,183	52.8	528	23.5	3.0	2.0 – 4.0	Mostly
Medication recording feature on a cardiac monitor when administering medications (adult or pediatric)	1,043	46.6	582	25.9	3.0	2.0 – 4.0	Mostly
Trauma score template (paper or electronic) when managing critical trauma patients.	1,230	55.0	823	36.6	3.0	2.0 – 4.0	Mostly
GCS scoring template (paper or electronic) when treating patients (any condition or age).	1,510	67.5	1,046	46.5	3.0	2.0 – 4.0	Mostly
Mnemonic (paper or electronic) for communication when performing a patient handoff	1,028	45.9	579	25.7	2.0	1.0 – 4.0	Somewhat

Table 1. Initial education use, requirements, and perceived usefulness of cognitive aids.

between participants responses describing if they used each aid during their initial education program and if a policy was present requiring their use.

FREQUENCY OF USE AND PERCEIVED USEFULNESS OF COGNITIVE AIDS

Table 3 shows the relation between perceived usefulness and frequency of use. Perceived usefulness of all 15 cognitive aids demonstrated a moderate positive correlation with the frequency of use among participants during patient care. As perceived usefulness of a cognitive aid increased, so did its frequency of use.

Cognitive Aid	Use During Education Program		Required to Use	
	Yes	No	Yes	No
Phone or tablet application, specifically designed to calculate medications, for adult medication calculation	2.0 (2.0 – 3.0)	1.0 (0.0 – 2.0)	3.0 (2.0 – 3.0)	1.0 (0.0 – 2.0)
Phone or tablet application, specifically designed to calculate medications, for pediatric medication calculation	3.0 (2.0 – 4.0)	1.0 (0.0 – 3.0)	3.0 (2.0 – 4.0)	1.0 (0.0 – 3.0)
Calculator (handheld calculator device or a calculator on a phone or tablet) for adult medication administration	2.0 (1.0 – 3.0)	1.0 (0.0 – 2.0)	3.0 (2.0 – 3.0)	1.0 (0.0 – 2.0)
Calculator (handheld calculator device or a calculator on a phone or tablet) for pediatric medication administration	3.0 (2.0 – 4.0)	1.0 (0.0 – 2.0)	3.0 (2.0 – 4.0)	2.0 (0.0 – 3.0)
Pocket guides to reference treatment algorithms when managing patients in cardiac arrest.	2.0 (1.0 – 3.0)	0.0 (0.0 – 1.0)	2.0 (1.0 – 3.0)	1.0 (0.0 – 2.0)
Length-based tape (e.g., Broselow tape) when treating pediatric emergencies	3.0 (2.0 – 4.0)	1.0 (0.0 – 2.0)	3.0 (2.0 – 4.0)	2.0 (0.0 – 3.0)
Color-based medication reference cards when treating pediatric emergencies	3.0 (2.0 – 4.0)	0.0 (0.0 – 2.0)	3.0 (2.0 – 4.0)	1.0 (0.0 – 2.0)
Checklist (paper or digital) when performing procedures (e.g., endotracheal intubation, supraglottic airway placement, medication administration)	2.0 (0.0 – 3.0)	0.0 (0.0 – 1.0)	3.0 (2.0 – 4.0)	0.0 (0.0 – 1.0)
Checklist (paper or digital) for managing patients in cardiac arrest (e.g., CPR checklists, defibrillation checklists)	2.0 (0.0 – 3.0)	0.0 (0.0 – 1.0)	3.0 (2.0 – 4.0)	0.0 (0.0 – 1.0)
Protocol referencing (paper or digital) when treating patients (any condition or age)	2.0 (2.0 – 3.0)	2.0 (0.0 – 2.0)	3.0 (2.0 – 3.0)	2.0 (0.0 – 2.0)
Paper templates for note taking when treating patients (any condition or age)	2.0 (1.0 – 3.0)	0.0 (0.0 – 2.0)	3.0 (2.0 – 4.0)	1.0 (0.0 – 2.0)
Medication recording feature on a cardiac monitor when administering medications (adult or pediatric)	3.0 (2.0 – 3.0)	1.0 (0.0 – 2.0)	3.0 (2.0 – 4.0)	1.0 (0.0 – 2.0)
Trauma score template (paper or electronic) when managing critical trauma patients.	3.0 (2.0 – 4.0)	0.0 (0.0 – 2.0)	3.0 (2.0 – 4.0)	1.0 (0.0 – 2.0)
GCS scoring template (paper or electronic) when treating patients (any condition or age).	3.0 (2.0 – 4.0)	1.0 (0.0 – 2.0)	3.0 (3.0 – 4.0)	1.0 (0.0 – 2.0)
Mnemonic (paper or electronic) for communication when performing a patient handoff	2.0 (1.0 – 4.0)	0.0 (0.0 – 1.0)	3.0 (2.0 – 4.0)	0.0 (0.0 – 1.0)

Table 2. Medians and interquartile ranges representing frequency of use of cognitive aids by use during education program and requirements to use.

MULTIVARIATE ANALYSIS

Ordinal probit regression models were assessed with and without inclusion of demographic and employment characteristics; inclusion was determined to improve model fit and R^2 values. Thus, the statistics reported in Table 4 were based on models that controlled for age, gender, race, EMS provider level, level of education, primary work location, EMS employment type, and primary community type. Years of experience was not included, as it did not show statistical significance in bivariate analysis.

Use during initial education programs, requirements for use per an organizational or medical control policy or protocol, and perceived usefulness of cognitive aids all retained statistical significance after controlling for demographic and employment characteristics. Generally, high levels of perceived usefulness (i.e., "mostly" or "very" useful) demonstrated the largest effect on frequency of use, followed by requirements to use the cognitive aid, and, as the least influential factor, use during education programs.

Cognitive Aid	Correlation Coefficient
Phone or tablet application, specifically designed to calculate medications, for adult medication calculation	0.41
Phone or tablet application, specifically designed to calculate medications, for pediatric medication calculation	0.46
Calculator (handheld calculator device or a calculator on a phone or tablet) for adult medication administration	0.47
Calculator (handheld calculator device or a calculator on a phone or tablet) for pediatric medication administration	0.49
Pocket guides to reference treatment algorithms when managing patients in cardiac arrest.	0.44
Length-based tape (e.g., Broselow tape) when treating pediatric emergencies	0.55
Color-based medication reference cards when treating pediatric emergencies	0.51
Checklist (paper or digital) when performing procedures (e.g., endotracheal intubation, supraglottic airway placement, medication administration)	0.54
Checklist (paper or digital) for managing patients in cardiac arrest (e.g., CPR checklists, defibrillation checklists)	0.53
Protocol referencing (paper or digital) when treating patients (any condition or age)	0.49
Paper templates for note taking when treating patients (any condition or age)	0.55
Medication recording feature on a cardiac monitor when administering medications (adult or pediatric)	0.50
Trauma score template (paper or electronic) when managing critical trauma patients.	0.53
GCS scoring template (paper or electronic) when treating patients (any condition or age).	0.53
Mnemonic (paper or electronic) for communication when performing a patient handoff	0.61

Table 3. Spearman Correlation Coefficient and P value between Frequency of Use and Perceived Usefulness of Cognitive Aids.

Cognitive Aid	Use during Education Programs	Required to Use	Perceived usefulness			
			Slightly	Somewhat	Mostly	Very
Digital application for adult medication calculation	0.76	0.82	0.92	1.28	1.76	2.07
Digital application for pediatric medication calculation	0.64	0.71	0.56 α	0.86	1.19	1.78
Calculator for adult medication administration	0.61	0.77	0.56	0.95	1.38	1.82
Calculator for pediatric medication administration	0.49	0.66	0.38 α	0.73	1.10	1.72
Pocket guides for cardiac arrest	0.58	0.81	0.68	1.01	1.32	1.70
Length-based tape	0.57	0.86	0.78	1.09	1.48	2.28
Color-based medication reference cards	0.69	0.86	0.71	1.01	1.25	1.96
Checklist when performing procedures	0.39	1.39	0.57	0.97	1.38	1.74
Checklist for managing patients in cardiac arrest	0.43	1.22	0.69	1.11	1.47	1.89
Protocol referencing	0.44	0.75	0.49 α	0.89	1.32	1.81
Paper templates for note taking	0.49	0.88	0.61	0.95	1.44	1.89
Medication recording feature on cardiac monitor	0.64	0.95	0.68	0.95	1.52	1.87
Trauma score template	0.64	1.11	0.66	0.88	1.37	1.78
GCS scoring template	0.55	1.17	0.92	1.00	1.43	2.03
Mnemonic for communication during patient handoff	0.75	1.24	0.59	0.92	1.45	1.96
* Controlled for age, gender, race, EMS provider level, level of education, primary work location, EMS employment type, and primary community type. ± Reference category = Not at all useful α Significant at the p < .05 level. All other coefficients were significant at the p < .001 level.						

Table 4. Coefficients from Ordinal Probit Regression Predicting Frequency of Use.

DISCUSSION

USE DURING INITIAL EDUCATION

Six cognitive aids were reported as being used by more than half of the participants during their initial education programs (table 1). The most common aid used during initial education was the LBT (n=1724, 77.0%). This was an expected finding as the use of these aids are commonly part of EMS training programs (R. L. Lammers et al., 2022). Although the National Highway and Traffic Safety Administration EMS Education Standards do not specifically reference LBTs, they do mention the use of resources and tools for safe administration of weight-based medication (National Highway and Traffic Safety Administration, 2021). These tapes, specifically the Broselow-Luten tape, have been used for many years to assist with pediatric medication dosing (DeBoer et al., 2005).

The use of resources and tools to promote safe weight-based medication dosing did not extend to digital technology during initial education. We found that digital cognitive aids for pediatric or adult medication calculations were the least likely to be used during EMS initial education programs. There is little research on why these types of aids are not used in this setting. This may be due to limited availability of this technology. Additionally, there is limited research on the efficacy of such aids compared to others (Luten et al., 2007). Programs may choose traditional paper aids as they are more commonly found in ambulances (Hoyle et al., 2017). Additionally, a stigma of mobile application use during educational sessions (O'Bannon & Thomas, 2014) may contribute to this.

All 15 cognitive aids were more likely to be used during patient care when the provider trained with the aid during initial education. This was expected as integrating these aids when clinical skills are first taught could result in a habit formation where it becomes automatic to use it when the skill is being performed (Smith & Graybiel, 2016). Additionally, training with the aid would increase familiarity and allow clinicians to experience the benefits of use, such as simplifying a task and reducing cognitive load (Corazza et al., 2020; Hall et al., 2020). This is an important finding as it supports that having clinicians practice with these aids during initial education is an essential cognitive aid implementation strategy.

REQUIRED COGNITIVE AID USE

We anticipated that a large percentage of participants (53.0%) would report policy or protocol requirements for LBT use. This aid is often stipulated in protocols due to its accuracy estimating weight in pediatric patients (Michigan Department of Health and Human Services, 2017). The prevalence of this aid's requirement underscores its perceived value to EMS care. We did not expect a significant number of participants reporting requirements to use other cognitive aids, such as protocol references, as reported by 42.2% of participants. Given that EMS protocols can be extensive and multifaceted, clarity is needed regarding the specific information these references provide. This raises questions about the items within the protocol references that are deemed essential enough to require their use, and if there is a more effective way to help clinicians reference that information during patient care.

The relationship between policies or protocols and the frequency of cognitive aid use was evidenced in our study. All 15 cognitive aids we examined showed a statistically

significant increase in use when mandated by such policies. This supports the premise that formal requirements bolster the implementation of tools and procedures. EMS clinicians typically operate without direct supervision (Ericsson et al., 2022), and the absence of systematic record-keeping for the use of cognitive aids makes it difficult to confirm adherence to policy requiring the aid use. Our findings indicate compliance among EMS personnel with mandated cognitive aid use, a practice that can enhance patient care.

PERCEIVED USEFULNESS

Cognitive aids associated with pediatric medication administration were reported as the most useful aids. These included the LBT, phone or tablet application for calculating pediatric medications, and pediatric color-based medication references. Medication dosing errors in EMS have long been cited in research (Hobgood et al., 2006; Misasi & Keebler, 2019; Patterson et al., 2014), especially pediatric dosing errors (Hoyle et al., 2020; Kaji et al., 2006; R. Lammers et al., 2012). In our previous study, we found that pediatric cognitive aids were among the most frequently used (Harmer et al., 2024). This is likely due to providers' awareness of pediatric medication dosing errors and being uncomfortable with pediatric emergency care (Fowler et al., 2018). Additionally, many of these aids are included in policies and protocols, meaning they are essentially endorsed by regulating bodies (Michigan Department of Health and Human Services, 2017).

We further found that perceived usefulness of all 15 cognitive aids demonstrated a positive correlation with the frequency of use during patient care. This was an expected finding as it aligns with the Technology Acceptance Model. This model is widely used to predict and explain user behavior associated with tools and technology (Chuttur, 2009). It suggests that perceived usefulness and ease of use determine an individual's likelihood to use the system or tool (Davis, 1989).

LIMITATIONS

This study has the typical limitations of survey research. The survey carried a low response rate of 2.88% and may involve self-selection bias. Some demographic information differed between those who participated in the survey and demographic characteristics of the EMS workforce, suggesting that the results from survey participants may not generalize to the broader population of EMS clinicians and systems. Recall bias may be present due to the infrequent use of many aids we examined. Recalling use during initial training may be difficult for those who have been practicing for an extended time. We surveyed six states with four of them located in the southern region of the country. The results of cognitive aid use in these states may not generalize to other areas.

CONCLUSION

This study demonstrates a significant relationship between the perceived usefulness of cognitive aids, training with these aids during initial education programs, institutional policies mandating their use, and use by practicing EMS clinicians. These findings can inform strategies to enhance EMS implementation and adoption of cognitive aids. Practical utility, familiarity through training, and regulatory guidelines are key drivers to increase their use. Further studies are needed to identify additional factors that can encourage use of cognitive aids in EMS, and how that use impacts patient outcomes.

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